SCIENTIFIC PUBLISHING: PROBLEMS AND PERSPECTIVES

Matthias Seaman*
Inter-Research Science Center
21385 Oldendorf / Luhe
Germany

**This article expresses my personal opinions; it is not a policy statement on behalf of Inter-Research.*

Abstract: Quality of and access to peer-reviewed literature are increasingly compromised. The quality of scientific manuscripts (not necessarily of the science itself) has been declining in the past decades, along with a general deterioration of writing skills among large sectors of the population. This makes it more onerous and costly for editors and publishers to maintain high standards. The solution to this problem lies with the education system: universities must ensure that their graduates know how to write, and research institutions must implement an effective internal pre-submission review of the mss they produce. Accessibility of the primary literature has been curtailed by inflation of journal prices and budgetary constraints in libraries. Negotiation of subscriptions between national consortia and publishers - thus excluding intermediaries - can restore widespread access to peer-reviewed journals.

Keywords: Communication; writing; scientific journals; peer review; publishing; library subscriptions; consortia.

1. Decline In Writing Skills

The ability of authors to communicate effectively in written form has declined in recent decades. This is a general phenomenon that affects scientific texts (e.g. Dillon 2011), but is also widespread across society (e.g. including the US Supreme Court; Liptak 2010), and it is not limited to the English-speaking world (e.g. Arteta 2011).

The root of the problem may be that language in humans is by nature oral; written communication is an artifact of civilization and was restricted to an elite until the 19th century. When the Industrial Revolution created a need for extensive, complex and reliable information exchange, literacy became widespread in industrial societies and the intellectual class expanded greatly. Nevertheless, humans will generally prefer to communicate orally if feasible (e.g. calling on the phone rather than writing).

Progress in communication technology (telephone, radio, television, modern IT) during the 20th century has expanded possibilities for long-range oral communication and eroded the importance of written composition. Nowadays, email and SMS combine characteristics of both oral and written communication. The latest developments in computer technology are expected to further modify communication behavior in humans

in ways that are at odds with scientific requirements for brevity, accuracy, and precision (e.g. Richtel 2010).

Oral communication is usually conceived more spontaneously than written text, and is comparatively "noisy" and verbose. Insufficient training in literary composition results in manuscripts (mss) that resemble spoken messages: overlong, and lacking in organization, accuracy and precision (e.g. due to limited vocabulary, inappropriate terminology, faulty grammar, and errors in logic).

In scientific publishing, this is aggravated by the exigencies of the "publish or perish" principle, which induces authors (young authors in particular) to try their luck with mss prepared "quick and dirty." The problem is compounded by the increasing proportion of mss that are written by scientists who are not native English speakers (e.g. Anonymous 2010), and whose texts have not been corrected by a native English speaker (publishers and editors acknowledge the travails endured by scientists who have to write in a foreign language, but the problem remains).

Poorly prepared mss are more onerous for editors and referees to review, and increase the cost of high-quality publishing, at a time when shrinking library budgets and pressure from subscription services are reducing publishers' revenues.

The resulting deterioration in scientific communication cannot be offset by increasing dissemination of reports that have not been quality-controlled, e.g. self-published grey literature on the Internet. The increasing burden on editors and publishers who attempt to maintain ms quality through peer review and copy editing threatens the quality of primary journals; an impending decline in the quality of science publications appears unavoidable.

2. Quality Of Scientific Manuscripts

2.1. Original Manuscript Submission

About half of all mss submitted to Inter-Research (IR) journals nowadays have the quality of a preliminary draft, and the proportion of poorly written mss is increasing. Apart from the quality of the writing, problems range from basic issues (such as authors neglecting to specify which journal a ms is being submitted to, or the ms lacking numbered pages and lines) to defects that make it impossible to comprehend the scientific content (e.g. unlabeled *x*- and *y*-axes in graphs); the literature cites, in particular, are often a veritable mess.

In the worst cases (perhaps 5% of submissions), mss are rejected outright; more often than not, however, obviously deficient mss are sent out for review under the basic assumption that the scientific content is worthy of consideration and the shortcomings of the presentation will be straightened out later on. A good editor will not want to miss out on a potentially good paper, just because it is poorly written. This benevolent approach becomes unsustainable, however, when poorly prepared mss become the norm rather than the exception, and begin to clog the review and production processes.

From the viewpoint of editors and publishers, increasing the rate of pre-rejections (i.e. rejections without review) is an easy way out, and the Editors-in-Chief of IR journals have therefore decided on a more stringent editorial policy for eliminating substandard mss.

Meaningful solutions can only be implemented by (1) universities, which must improve their teaching of analytical and writing skills (e.g. Rimer 2011) in careful ms preparation (e.g. Day & Gastel 2006); and (2) research institutions, which must improve their mentoring of young researchers and conduct a critical pre-submission review of mss prepared by their staff. Weeding out the problems in the mss before their submission would make the peer review and publication process more efficient for authors - not only for referees, editors and publishers - as well as improving the quality of published articles.

2.2. Peer Review

Peer review is the pillar of quality control in scientific publishing (e.g. Kinne 1999, Wager 2006), but as mss require more work for a proper review and referees are constrained to spend more time on tasks such as raising funds, the willingness to review has been diminished. When I started work as an editor in 2002, about 1/3 of the potential referees declined to review; today, the proportion is 2/3 and rising.

Reviews are also becoming shorter and more perfunctory, as well as poorly written, and the referees need more time to prepare them. Editors preferentially select the most conscientious referees, who become overloaded with requests to review.
Furthermore, the referees often expend more effort on correcting the 'beginner's' mistakes in a ms, instead of critically evaluating the scientific content and helping authors to improve it. These problems appear to be even more pronounced in minor journals (as I have learned from other editors) than in IR journals.

Editors are subject to the same constraints as authors and referees, and are often overcommitted with administrative tasks at their institutions. Most editors devote much time and energy to the mss assigned to them, and the review process does result in considerable improvements; nevertheless, it cannot fully rectify shortcomings in substandard mss.

Even under the best circumstances, the peer review process can never be perfect. The proportion of false decisions (false acceptances as well as false rejections) may be as high as 25 to 40%; the probability of correct decisions increases with the number of referees involved (2, in most journals), as does the quality of the ms (Neff & Olden 2006). IR journals continue to use 3 to 4 referees per ms (see also Stewart 2010).

IR publishes articles co-authored by its Editors with free Open Access, in order to provide a tangible reward for their services. The introduction of centralized ms management at IR in 2007 makes it possible for the publisher's full-time staff to assist editors and speed up the review process, e.g. by selecting additional referees from the IR

database when needed, or deciding on mss when an editor is unavailable (e.g. on field work or sick leave); for some mss, more than 20 referees are contacted to secure 3 reviews.

Nevertheless, the decrease in the time available to scientists for reviewing mss undermines quality control in scientific publishing. Lack of time to review has become a structural problem that no publisher can hope to fully compensate for. It has been suggested that reviews should be paid for by publishers, but this would increase the price of publishing. What is needed is for scientific institutions to again grant their staff more time for *pro bono* work such as reviewing mss and editing journals.

2.3. Publication Process

Every ms accepted for publication requires editing, from the mere correction of spelling errors to extensive rewriting needed to make the paper intelligible. As the proportion of poorly prepared submissions increases, so does the proportion of poorly prepared mss that are accepted for publication. The publisher's staff may be forced to consult authors repeatedly over inconsistencies in the text or the presentation of data. This slows down the production process, increases its cost, and is an aspect of the publisher's value-added service that is often underappreciated by authors and readers.

Moreover, production by most science publishers nowadays relies on poorly paid copy editors and typesetters who work freelance or with service providers in developing countries. These workers are under pressure to achieve a high ms turnover, at the expense of thoroughness in the production process. IR also employs freelancers, to a limited extent. However, the bulk of the production process is in the hands of well-trained in-house staff.

In some cases, substandard mss accepted for an IR journal are returned to the authors for further revision (including correction by a native English speaker, if necessary) before they enter the production process.

All in all, however, the production process cannot fix deficient mss; it can only repair basic flaws. Better ms quality must be achieved at the earliest stages in the process (see Sec. 2.1.). In the case of scientific papers that may have flawed content, IR journals offer the scientific community the possibility to criticize published articles through a Comment / Reply Comment procedure (Kinne 2002). Publications that are unintelligible, on the other hand, will be ignored by the readers, regardless of scientific content.

3. Availability Of Primary Literature

The Internet today affords unprecedented possibilities for instant and worldwide communication. Paradoxically, the availability of peer-reviewed literature has been severely curtailed over the past few decades, as libraries have been forced to eliminate titles from their stock, due to the increase in journal prices, as well as reductions in library budgets.

Inflation in journal prices is driven by: (1) Large publishing corporations, which focus on

profit maximization (low cost–benefit ratios), rather than scientific quality, and use their financial success to acquire smaller publishers; this monopolistic trend appears to be irreversible. (2) Large, profit-driven subscription services, which exact considerable discounts from the publishers (5 to 20%), forcing them to raise their subscription fees accordingly.

Thus, taxpayer money earmarked for science and education has in recent decades been increasingly diverted into the pockets of managers and investors who know nothing of, and care little for scientific research and education. The scientific community has lost control of its primary means of communication.

In the 19th century, scientific publishing was mostly in the hands of scientists. Journals were usually published by non-profit entities (learned societies or government institutions), and emerging commercial enterprises were often founded by leading scientists who strove to serve the scientific community in a different capacity, as disseminators of information. IR follows in this tradition; its president, Otto Kinne, served as a scientist and director of a research institute for 3 decades prior to becoming a publisher.

Although librarians have not caused the restricted accessibility of peer reviewed literature in recent decades, in my opinion they have a key role in re-establishing wider access; this requires that librarians become more economically astute. One proposed solution, namely switching from the "reader pays" to a "writer pays" model (e.g. Open Access publishing), would not resolve the dilemma. It would expand access to the scientific literature, but shift the financial bottleneck from payments for subscribing to journals to payments for publishing articles; hence it would hinder publication by scientists with insufficient funds, and require funds to be reallocated from library to research budgets. Most of all, it would not affect the fundamental issue, namely the diversion of public funds from the science sector into non-scientific commercial channels.

The negotiation of large-scale consortium deals (e.g. at the national level) - a strategy that IR welcomes - may succeed in providing widespread access to the peer-reviewed literature, as well as redressing the overpricing policies of the near-monopolistic publishers. In particular, direct negotiation between consortia and publishers helps small high-quality science publishers such as IR to resist the pressure exerted by some of the principal subscription agencies, and it can serve the interests of both scientists and publishers by eliminating the diversion of funds to the intermediaries.

Consortium agreements can thus become an important factor toward upholding a high standard in scientific publishing, in addition to restoring extensive access for the scientific community.

Acknowledgements: K. Hickox, O. Kinne, J. Mellersh, F. Seaman and I. Stewart criticized the draft of this text.

References

Anonymous. 2010. "Global science: climbing Mount Publishable - The old scientific powers are starting to lose their grip. *The Economist*, Nov 11, 2010.

Arteta A. 2011. 'Archisilabeando'. *El País* (Madrid), Jan. 19, 2011. http://www.elpais.com/articulo/opinion/Archisilabeando/elpepiopi/20110119elpepiopi_4/Tes (in Spanish).

Day, R. A., Gastel B. 2006. *How to write and publish a scientific paper*, 6th ed. Greenwood Press, Westport, CT, USA.

Dillon, S. 2011. Journal showcases dying art of the research paper. *New York Times*, Jan. 7, 2011 (http:// www.nytimes.com/2011/01/08/education/08research.html?hpw).

Kinne, O. 1999. Electronic publishing in science: changes and risks. *Marine Ecology Progress Series* 180: 1–5.

Kinne, O. 2002. Importance and organisation of direct post-publication critique. *Marine Ecology Progress Series* 228: 1.

Liptak, A. 2010. Justices are long on words but short on guidance. *New York Times*, Nov. 17, 2010 (http:// www.nytimes.com/2010/11/18/us/18rulings.html?pagewanted=1&ref=global-home).

Neff BD, Olden JD. 2006. Is peer review a game of chance? *BioScience* 56: 333–340.

Richtel, M. 2010. Growing up digital, wired for distraction. *New York Times*, Nov. 21, 2010. http://www. nytimes.com/2010/11/21/technology/21brain.html?ref=global-home.

Rimer ,S. 2011. Study: many college students not learning to think critically. *Hechinger Report*, Jan. 18, 2011 http://www.mcclatchydc.com/2011/01/18/106949/study-many-college-students-not.html

Stewart, I. 2010. Inter-Research: 30 years of quality science publishing. In: Barr ,D (ed) *Confluence of ideas: evolving to meet the challenges of global change. Proc. 35th IAMSLIC Annual Conference*. IAMSLIC, Newport, OR, p. 161–165.

Wager, E. 2006. "Ethics: what is it for?" http://www.nature.com/nature/peerreview/debate/nature04990.html.